

Root Diseases with White Pocket Rots

Big white pocket rot and red root rot

Pathogen—Several pathogens cause a white pocket rot in the roots and butts of conifers in the Rocky Mountain Region. However, discussed in this entry are *Phellopilus* (*Phellinus*) *nigrolimitatus*, which causes a root disease called big white pocket rot and two species, *Onnia* (*Inonotus*) *tomentosa* and *leporina* (formerly misnamed *O. circinata*), which cause a disease known as red root rot, or tomentosus and circinatus root rot, respectively. The following two pathogens (described separately in this guide) also cause white pocket rots and may be confused with the fungi described in this section: *Porodaedalea* (*Phellinus*) *pini* often grows down into roots and causes red ring rot in conifer stems; annosus root rot may also appear as a white pocket rot.

Hosts—Big white pocket rot and red root rot can infect most conifers, but they infect mostly spruce species in this Region.

Signs and Symptoms—Big white pocket rot (caused by *Phellopilus nigrolimitatus*) usually has no external indications. The fruiting body (conk) is uncommon and usually forms after the tree is dead. Conks are perennial, are flat on the bark, and often have a small shelf or cap at the upper end that is somewhat soft and spongy. The pore surface is cinnamon-colored and smooth with very small pores. The internal flesh is brown and typically has one or more black lines.

Red root rot (caused by *Onnia* species) usually has no external symptoms, but there may be some basal resinosis. Fruiting is uncommon but may be abundant in certain years. Fruiting bodies arise from buried roots with a short, more or less central stem or appear directly on the tree, usually at the root collar (figs. 1-2). Conks are annual and soft to leathery. The cap is circular with a sunken center, up to 4 inches (11 cm) in diameter, yellowish brown, and velvety. The lower, pore surface is pale brown but darkens with age. The two species of *Onnia* are virtually indistinguishable in the field, but conks of *O. leporina* are more likely to be on the base of the tree and in fewer numbers than those of *O. tomentosa*.

These diseases all cause a white pocket rot. Big white pocket rot has ellipsoidal pockets up to about 3/8 by 1 inch (10 by 25 mm), rectangular and white, separated by pale brown, firm wood (figs. 3-4). Pockets in the other decays are about 1/13 by 3/8 inch (2 by 10 mm) (fig. 5). Early decay caused by the *Onnia* species is indicated by a reddish stain of the wood (fig. 6). Roots in the soil may have small patches of golden brown fungal tissue on the surface (fig. 2). Zone lines could be present in decays by any of these fungi.

Disease Cycle—Initial infection is by spores from conks. The infection site is unknown but could be roots in the soil or basal stem wounds. Decay progresses for many years before fruiting occurs.



Figure 1. *Onnia tomentosa*, showing caps from above. Photo: Jim Worrall, USDA Forest Service.



Figure 2. *Onnia tomentosa*, showing caps from the sides and small patches of fungal mycelium on roots. Photo: Jim Worrall, USDA Forest Service.



Figure 3. Big white pocket rot. Pockets are up to 3/8 inch (1 cm) wide and many have white cellulose remains. Photo: Jim Worrall, USDA Forest Service.

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In the case of big white pocket rot, fruiting does not occur until after the tree is dead and down. With red root rot, there may be direct growth of the fungus tree-to-tree between contacting roots, leading to mortality centers, but that has not been shown with big white pocket rot.

Impact—Big white pocket rot is associated with old-growth stands and large-diameter trees. It causes extensive wood decay of the roots and butt and can grow far up the stem, leading to mechanical failure of live trees. In Scandinavia, *Phellinus nigrolimitatus* is a red-listed (protected) species. Studies have linked it to old-growth conditions and suggest that forest management reduces its population. This may be a consideration if management is considered in old-growth stands.

Red root rot is a damaging disease of spruces and other hosts elsewhere, causing large mortality centers. Although infected trees can be found in the Rocky Mountain Region and fruiting is sometimes abundant, major damage and mortality centers have not been documented thus far.

Management—Big white pocket rot can lead to tree failure in developed sites with large trees. Because of the difficulty of detection and damage that can be done by large trees, sounding and increment coring should be done carefully to detect the disease. For timber management in old-growth stands, consider the general abundance of the fungus, its presence in the area, and its potential sensitivity to management. However, there are no data indicating how common or rare the fungus is in this Region. Red root rot is normally not damaging enough to consider during timber management, but as with all root rots, it can be important and contribute to hazard when it occurs in developed sites.



Figure 4. Big white pocket rot. Decayed wood has weathered, leaving relatively sound wood between the pockets. Photo: Jim Worrall, USDA Forest Service.



Figure 5. Young fruiting body. Note the fine cords associated with the fruiting body. Photo: Jim Worrall, USDA Forest Service.



Figure 6. Red root rot caused by *Onnia* sp. Stain preceding decay in the butt of a sapling in British Columbia. Photo: Jim Worrall, USDA Forest Service.

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2. Sinclair, W.A.; Lyon, H.H. 2005. Diseases of trees and shrubs. 2nd ed. Ithaca, NY: Cornell University Press. 659 p.
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